MILITARY SPECIFICATION

CONNECTORS ELECTRICAL PLUGS AND RECEPTACLES COAXIAL, RADIO FREQUENCY
HIGH RELIABILITY FOR FLEXIBLE AND SEMIRIGID CABLES
GENERAL SPECIFICATION FOR

This amendment forms a part of MIL-C-31031 dated 29 March 1994 and is approved for use by all Departments and Agencies of the Department of Defense

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Delete and substitute 4 1 through 4 5 2 1 4 with the following

"4 1 Responsibility for inspection Unless otherwise specified in the contract or purchase order the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein Except as otherwise specified in the contract or purchase order the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein unless disapproved by the Government The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements

"4 1 1 Responsibility for compliance All items shall meet all requirements of sections 3 and 5 The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements however this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material

"4 1 2 Test equipment and inspection facilities Test and measuring equipment and inspection facilities of sufficient accuracy quality and quantity to permit performance of the required inspection shall be established and maintained by the contractor The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with MIL-STD-45662

"4 2 Classification of inspections The inspection requirements specified herein are classified as follows

a Qualification inspection (see 4 4)

b Quality conformance inspection (see 4 5)

"4 3 Inspection conditions Unless otherwise specified all inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-202 or MIL-STD-1344 For each test of threaded coupling connectors, where the test is performed on mated pairs the pair shall be torqued to the specified value (see 3 1)

"4 3 1 Product assurance program A product assurance program shall be established and maintained in accordance with MIL-STD-790 Evidence of such compliance shall be verified by the qualifying activity of this specification as a prerequisite for qualification and continued qualification The following exceptions to MIL-STD-790 shall apply

a Distributor category A An organization contractually authorized by a manufacturer to store and distribute (sell) completely finished parts These parts shall have been completely assembled and inspected by the manufacturer to all the applicable requirements of the specification

b Basic plan The manufacturer shall document a product assurance program plan in a manner adequate to demonstrate compliance to section 5 of MIL-STD-790 or intent to comply prior to receipt of qualification approval When the program plan indicates intent to comply, the documentation shall include an implementation schedule One program plan shall be required by a single manufacturing facility The qualifying activity shall determine the adequacy and approve the program plan insofar as it relates to the requirements specified in section 5 and appendixes A and B of MIL-STD-790

c Distributor organizations The manufacturers shall identify each authorized Category A, B or C distributor or distributor's assembly plant the function each organization is authorized to perform and the authorized address at which the functions are performed Any change in functions or the addition or deletion of a distributor or a distributor s assembly plant shall be reported to the qualifying activity within 10 days after such an occurrence

d Corrective action plan Where failures or defects are greater than the prescribed limits the manufacturer shall prepare a plan or recommendation for corrective action Corrective action recommendations for performance failures shall include failure mode information and shall be supported by verifying data or a proposed evaluation test plan Corrective action on parts covered by the specification which alter design parameters previously submitted to the qualifying activity shall not be made without approval from the qualifying activity, except those actions which consist only of improvements in control procedures Corrective action affecting control procedures shall not be implemented for production until approved by qualified personnel responsible for the engineering quality control and reliability functions of the manufacturer

e Process control Records shall cover the implementation of devices such as control charts (e g X bar and R charts) or other means of indication of the degree of control achieved in the production process records shall also indicate the action taken when each out of control condition is observed and the disposition of product not conforming to the manufacturers established prescribed limits Records associated with nonconforming products shall be held for a minimum of 3 years A formal statistical process control (SPC) program in accordance with ANSI/EIA-557 shall be established

f Controlled storage area The following shall not apply Such an area shall be maintained and no other parts shall be permitted in this area

g Manufacturing flowchart The following shall not apply The chart will identify all documents pertaining to the production process quality control points and production controls which were used The documents will be identified by name and number (see figure 1)

h Self-audit requirements Manufacturing flowcharts do not have to contain internal document control numbers pertaining to each process performed and quality control station

"4 3 2 Statistical process control (SPC) A SPC program shall be established and maintained in accordance with EIA-557 Evidence of such compliance shall be verified by the qualifying activity as a prerequisite for qualification and retention of qualification

"4 4 Qualification inspection Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6 3) on sample units produced with equipment and procedures normally used in production

"4 4 1 Sample size Connectors of the same PIN with its mating connector when applicable (see 1 2 1) shall be subjected to qualification inspection The number of samples shall be as specified in table II

"4 4 1 1 Sample size (contacts) Ten sets of pin and socket contacts shall be subjected to qualification inspection

4 4 2 Group qualification For group qualification of all series of connectors covered by this specification see 3 1 The Government reserves the right to authorize performance of any or all qualification inspection of additional types in the group that are considered necessary for qualification within each group

"4 4 3 Inspection routine The sample shall be subjected to the inspections specified in table II All sample units shall be subjected to the inspection of group I The sample size shall be as specified in table II The sample units shall then be subjected to the inspection for their particular group and in the sequence given for that group

"4 4 4 Failures One or more failures shall be cause for refusal to grant qualification approval

"4 4 5 Retention of qualification To retain qualification the contractor shall forward a report at 12- or 36-month intervals to the qualifying activity The qualifying activity shall establish the initial reporting date Initial retention of qualification shall be at a 12-month interval subsequent retention of qualification at a 36-month interval The report shall consist of

a A summary of the results of the test performed for inspection of product for delivery, groups A and B indicating as a minimum the number of lots that have passed and the number that have failed shall be submitted every 12 months The results of tests of all reworked lots shall be identified and accounted for

b A summary of the results of test performed for periodic inspection, group C including the number and mode of failures The summary shall include results of all periodic inspection tests performed and completed during the 36-month period If the summary of the test results indicates nonconformance with specification requirements, and corrective action acceptable to the qualifying activity has not been taken action may be taken to remove the failing product from the qualified products list

Failure to submit the report within 60 days after the end of each 12- or 36-month period may result in loss of qualification for the product In addition to the periodic submission of inspection data the contractor shall immediately notify the qualifying activity at any time during the 12- or 36-month period that the inspection data indicates failure of the qualified product to meet the requirements of this specification

NOTE In the event that no production occurred during the reporting period a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the item If during 3 consecutive reporting periods there has been no production the manufacturer may be required at the discretion of the qualifying activity to submit a representative product from each group as defined by 4 4 2 to testing in accordance with the qualification inspection requirements "

TABLE II Qualification inspection

Inspection	Requirement paragraph	Test method paragraph
Group I 1/		
Visual and mechanical inspection		
Material	3 3	4 6 1
Finish	3 3 1	4 6 1
Dissimilar metals	3 3 2	4 6 1
Design and construction (dimensions)	3 1 and 3 4	4 6 1
Marking	3 35	4 6 1
Mating (visual indication)	3 4 1	4 6 1
Force to engage/disengage		
Bayonet and threaded types	3 5 1	4 6 2 1
"Push-on" connector types	3 5 2	4 6 2 2
Coupling proof torque (when specified see 3 1)	3 6	4 6 3
Mating characteristics	3 7	4 6 4
Permeability of nonmagnetic materials	3 8	4 6 5
Workmanship	3 37	4 6 1
Hermetic seal (pressurized connectors)	3 9	4 6 6
Leakage (pressurized connectors)	3 10	4 6 7
Insulation resistance	3 11	4 6 8
Group II (3 samples) 2/		
Voltage standing wave ratio (VSWR)	3 14	4 6 11
Corrosion	3 13	4 6 10
Voltage standing wave ratio (VSWR)	3 14	4 6 11
Group III (3 samples)		
Voltage standing wave ratio (VSWR)	3 14	4 6 11
Connector durability	3 15	4 6 12
Vibration	3 18	4 6 15
Shock (specified pulse)	3 19	4 6 16
Temperature cycling 3/	3 20	4 6 17
Voltage standing wave ratio (VSWR)	3 14	4 6 11
Cable retention force	3 24	4 6 21
Group IV (3 samples)		
Dielectric withstanding voltage	3 17	4 6 14
Humidity	3 21	4 6 18
Corona level	3 22	4 6 19
RF high potential withstanding voltage	3 23	4 6 20
Coupling mechanism retention force	3 25	4 6 22
Safety wire hole pullout	3 30	4 6 27
Group V (3 samples)		
Shielding effectiveness	3 26	4 6 23
Group VI (3 samples)		
RF transmission loss	3 27	4 6 24

See footnotes at end of table "

"TABLE II Qualification inspection - Continued

Inspection	Requirement paragraph	Test method paragraph
Group VII (3 samples) 2/		
Humidity	3 21	4 6 18
Insulation resistance	3 11	4 6 8
Group VIII (3 samples)		
Solderability	3 29	4 6 26
Group IX (3 samples) 4/		
Thermal vacuum outgassing	3 31	4 6 28
Flammability	3 32	4 6 29
Odor	3 33	4 6 30
Toxicity	3 34	4 6 31
Group X (3 samples)		
Center contact retention (when specified see 3 1)	3 12	4 6 9
Corrosion 5/	3 13	4 6 10

1/ The number of samples is dependent on the number of groups tested

2/ Applicable to sealed connectors only

3/ Following this test and prior to performing VSWR, 3 cycles of mating and unmating shall be accomplished

4/ Applicable to qualification of space grade connectors only

5/ This corrosion test is not applicable to sealed connectors

"TABLE III Contact qualification and group B inspection

Inspection	Requirement paragraph	Test method paragraph
Group I		
Porosity	3 28	4 6 25

"4 5 Quality conformance inspection

"4 5 1 Inspection of product for delivery Inspection of product for delivery shall consist of groups A and B inspection

"4 5 1 1 Inspection lot An inspection lot shall consist of all the connectors and associated fittings comprised of identical piece parts produced under essentially the same conditions and offered for inspection at one time

4 5 1 2 Group A inspection Group A inspection shall consist of the inspections specified in table IV on in the order shown

"4 5 1 2 1 Sampling plan (group A) Table IV subgroup 1 tests shall be performed on a production lot basis Samples shall be selected in accordance with table V If one or more defects are found the lot shall be screened for that particular defect(s) and defects removed A new sample of parts shall be selected in accordance with table V and all group A tests again performed If one or more defects are found in the second sample the lot shall be rejected and shall not be supplied to this specification "

"TABLE IV Group A inspection 1/

Inspection	Requirement paragraph	Test method paragraph	Sampling procedure
Visual and mechanical inspection			
Material	3 3	4 6 1	
Finish	3 3 1	4 6 1	
Dissimilar metals	3 3 2	4 6 1	
Design and construction	3 1 and 3 4	4 6 1	See table V
Marking	3 35	4 6 1	
Workmanship	3 37	4 6 1	
Mating (visual indication)	3 4 1	4 6 1	
Hermetic seal (pressurized connectors) 2/	3 9	4 6 6	
Leakage (pressurized connectors) 2/	3 10	4 6 7	
Interface dimensions	3 4 3	4 6 1 1	

1/ Verification may be accomplished using the manufacturer s process controls providing these controls are clearly equal to or more stringent than the requirements of this specification

2/ These are in-process tests (100% inspection required) "

"4 5 1 2 2 Visual inspection (group A inspection) Each connector and accessory shall be visually examined for completeness workmanship and identification requirements Attention shall be given to those assemblies that require a gasket to determine the condition of the gasket Gaskets missing twisted buckled kinked, or damaged in any way shall be cause for rejection

NOTES

1 Major defect A major defect is a defect other than critical that is likely to result in failure or to reduce materially the usability of the unit of product for its intended purpose

2 Minor defect A minor defect is a defect that is not likely to reduce materially the usability of the unit of product for its intended purpose or is a departure from established standards having little bearing on the effective use or operation of the unit

3 Critical defect A critical defect is a defect that judgment and experience indicate is likely to result in hazardous or unsafe conditions for individuals using maintaining or depending upon the product or a defect that judgment and experience indicate is likely to prevent performance of the tactical function of a major end item such as a ship, aircraft tank, missile, or space vehicle

"4 5 1 2 3 Interface dimension inspection Inspection of the mating dimensions (nondestructive measurements only) in accordance with MIL-STD-348 is considered critical "

"TABLE V Inspection level for group A

Lot size	Visual and mechanical inspection	
	Major	Minor
1 to 8	All	5
9 to 15	All	5
16 to 25	20	5
26 to 50	20	5
51 to 90	20	7
91 to 150	20	11
151 to 280	20	13
281 to 500	47	16
501 to 1 200	47	19
1 201 to 3 200	53	23
3 201 to 10 000	68	29
10 001 to 35 000	77	35
35 001 to 150 000	96	40
150 001 to 500 000	119	40
500 001 and over	143	40

"

"4 5 1 3 Group B inspection Group B inspection shall consist of the inspections specified in table VI in the order shown and shall be made on sample units which have been subjected to and passed the group A inspection Connectors having identical piece parts may be combined for lot purposes and shall be in proportion to the quantity of each PIN numbered adapter produced

"4 5 1 3 1 Group B sampling plan A sample of parts shall be randomly selected in accordance with table VII If one or more defects are found the lot shall be screened for that particular defect(s) and defects removed After screening and removal of defects a new sample of parts shall be randomly selected and subjected to all tests in accordance with table VI If one or more defects are found in the second sample the lot shall be rejected and shall not be supplied to this specification "

"TABLE VI Group B inspection

Inspection	Requirement paragraph	Test method paragraph
Force to engage/disengage		
Bayonet and threaded types	3 5 1	4 6 2 1
"Push-on" connector types	3 5 2	4 6 2 2
Coupling proof torque (when specified see 3 1)	3 6	4 6 3
Mating characteristics	3 7	4 6 4
Permeability of nonmagnetic materials	3 8	4 6 5
Dielectric withstanding voltage	3 17	4 6 14
Insulation resistance	3 11	4 6 8
Voltage standing wave ratio (VSWR) (cabled)	3 14	4 6 11

"TABLE VII Inspection level for group B

Lot size	Sample size	VSWR sample size
1 to 8	5	1
9 to 15	5	1
16 to 25	5	2
26 to 50	5	2
51 to 90	5	3
91 to 150	11	3
151 to 280	13	3
281 to 500	16	3
501 to 1 200	19	5
1 201 to 3 200	23	5
3 201 to 10 000	29	5
10 001 to 35 000	35	5
35 001 to 150 000	40	8
150 001 to 500 000	40	8
500 001 and over	40	8

"4 5 1 3 2 Disposition of sample units Sample units which have passed all the group B inspection may be delivered on the contract or purchase order if the lot is accepted Any connector or connector part deformed or otherwise damaged during testing shall not be delivered on the contract or order

"4 5 2 Periodic inspection Periodic inspection shall consist of group C Except where the results of these inspections shown noncompliance with the applicable requirements (see 4 5 2 1 4) delivery of products which have passed groups A and B shall not be delayed pending the results of these periodic inspections

"4 5 2 1 Group C inspection Group C inspection shall consist of the inspections specified in table VIII in the order shown Group C inspection shall be made on sample units selected from inspection lots which have passed the groups A and B inspection "

"TABLE VIII Group C inspection

Inspection	Requirement paragraph	Test method paragraph
Subgroup 1		
Corrosion 1/	3 13	4 6 10
Center contact retention (when specified see 3 1)	3 12	4 6 9
Subgroup 2 2/		
Voltage standing wave ratio (VSWR)	3 14	4 6 11
Corrosion	3 13	4 6 10
Voltage standing wave ratio (VSWR)	3 14	4 6 11
Subgroup 3		
Voltage standing wave ratio (VSWR)	3 14	4 6 11
Connector durability	3 15	4 6 12
Vibration	3 18	4 6 15
Shock (specified pulse)	3 19	4 6 16
Temperature cycling 3/	3 20	4 6 17
Voltage standing wave ratio (VSWR)	3 14	4 6 11
Cable retention force	3 24	4 6 21
Subgroup 4		
Humidity	3 21	4 6 18
Corona level	3 22	4 6 19
RF high potential withstanding voltage	3 23	4 6 20
Coupling mechanism retention force	3 25	4 6 22
Safety wire hole pullout	3 30	4 6 27
Subgroup 5		
Shielding effectiveness	3 26	4 6 23
Subgroup 6		
RF transmission loss	3 27	4 6 24
Subgroup 7		
Contact resistance	3 16	4 6 13

1/ Not applicable to sealed connectors

2/ Applicable to sealed connectors only

3/ Following this test and prior to performing VSWR 3 cycles of mating and unmating shall be accomplished "

'4 5 2 1 1 Sampling plan Fourteen sample units of the same PIN shall be selected from the first lot produced after the date of notification of qualification Thereafter fourteen sample units of the same PIN shall be selected from current production after 200 000 connectors have been produced or not less than once every year whichever occurs first The sample units shall be divided equally and subjected to the inspections of the seven subgroups

"4 5 2 1 2 Failures If one or more sample units fails to pass group C inspection the sample lot shall be considered to have failed

4 5 2 1 3 Disposition of sample units Sample units which have been subjected to group C inspection shall not be delivered on the contract or order

"4 5 2 1 4 Noncompliance If a sample fails to pass group C inspection the manufacturer shall notify the qualifying activity and the cognizant inspection activity of such failure and take corrective action on the materials or processes or both as warranted and on all units of product which can be corrected and which are manufactured under essentially the same materials and processes and which are considered subjected to the same failure Acceptance and shipment of the product shall be discontinued until corrective action acceptable to the qualifying activity has been taken After the corrective action has been taken group C inspection shall be repeated on additional sample units (all tests and examinations or the test which the original sample failed at the option of the qualifying activity) Groups A and B inspections may be reinstituted however final acceptance and shipment shall be withheld until the group C inspection has shown that the corrective action was successful In the event of failure after reinspection information concerning the failure shall be furnished to the cognizant inspection activity and the qualifying activity

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6 3 delete and substitute the following

"6 3 Qualification With respect to products requiring qualification awards will be made only for products which are at the time of award of contract qualified for inclusion in Qualified Products List QPL No 31031 whether or not such products have actually been so listed by that date The attention of the contractors is called to these requirements and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification The activity responsible for the Qualified Products List is the Defense Electronics Supply Center (DESC-ELD) 1507 Wilmington Pike Dayton Ohio 45444-5765 "

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Delete and substitute cable group VIII as follows

"Group VIII

Cable M17/	Zo	F	Dielectric	Group VIII Category A C
2-RG6	75	3	PE	X
180-00001 1/	75	3	PE	X
73-RG212	50	11	PE	X
162-00001	50	0 4	PE	X
188-00001 1/	50	11	PE	X
199-00001 1/	50	0 4	PE	X
112-RG304	50	12 4	PTFE	*
171-00001	50	0 4	PTFE	X

1/ This cable is intended for low smoke applications "

Delete and substitute cable groups X and XII as follows

"Group X

Cable M17/	Zo	F	Dielectric	Group	X	Xa		Xb		Xc	Xd
				Category	A	C	D	C	D	C	C
6-RG11	75	1	PE		X					X	
181-00001 1/	75	1	PE		X					X	
62-RG144	75	3	PTFE		X					X	
65-RG165	50	3	PTFE		X	*					
159-00001	50	0 4	PTFE		X	X					
74-RG213	50	1	PE		X	X					
189-00001 1/	50	1	PE		X	X					
163-00001	50	0 4	PE		X	X					
75-RG214	50	11	PE		X			X			
190-00001 1/	50	11	PE		X			X			
164-00001	50	0 4	PE		X			X			
86-00001	50	0 4	PTFE		X			*			
127-RG393	50	11	PTFE		*			X			
174-00001	50	0 4	PTFE		X			X			
77-RG216	75	3	PE		X						*
191-00001 1/	75	3	PE		X						X

1/ This cable is intended for low smoke applications "

"Group XII

Cable M17/	Zo	F	Dielectric	Group	XII	
				Category	A	C
78-RG217	50	3	PE		*	
165-00001	50	0 4	PE		X	
192-00001 1/	50	3	PE		X	

1/ This cable is intended for low smoke applications "

Delete and substitute cable group XV as follows

Group XV

Cable M17/	Zo	F	OD (mm)	Dielectric	Groups XV	XVI	XVII	XVIII	XIX
129-RG401	50	18	6 35	PTFE	X				
129 00001	50	18	6 35	PTFE	X				
130-RG402	50	20	3 58	PTFE		X			
130-00001	50	20	3 58	PTFE		X			
130-00002	50	20	3 58	PTFE		X			
130-00003	50	20	3 58	PTFE		X			
130-00004	50	20	3 58	PTFE		X			
130 00005	50	20	3 58	PTFE		X			
130-00006	50	20	3 58	PTFE		X			
130 00007	50	20	3 58	PTFE		X			
133-RG405	50	20	2 18	PTFE			X		
133-00001	50	20	2 18	PTFE			X		
133-00002	50	20	2 18	PTFE			X		
133-00003	50	20	2 18	PTFE			X		
133-00004	50	20	2 18	PTFE			X		
133-00005	50	20	2 18	PTFE			X		
133-00006	50	20	2 18	PTFE			X		
133-00007	50	20	2 18	PTFE			X		
133-00008	50	20	2 18	PTFE			X		
133-00009	50	20	2 18	PTFE			X		
133-00010	50	20	2 18	PTFE			X		
133-00011	50	20	2 18	PTFE			X		
151-00001	50	20	1 19	PTFE				X	
151-00002	50	20	1 19	PTFE				X	
154-00001	50	20	0 86	PTFE					X
154-00002	50	20	0 86	PTFE					X

CONCLUDING MATERIAL

Custodians
Army - CR
Navy - EC
Air force - 85
NASA - NA

Review activities
Army - AR AT MI
Navy - AS MC OS SH
Air Force - 19 99

Preparing activity
DLA - ES

(Project 5935-3986)